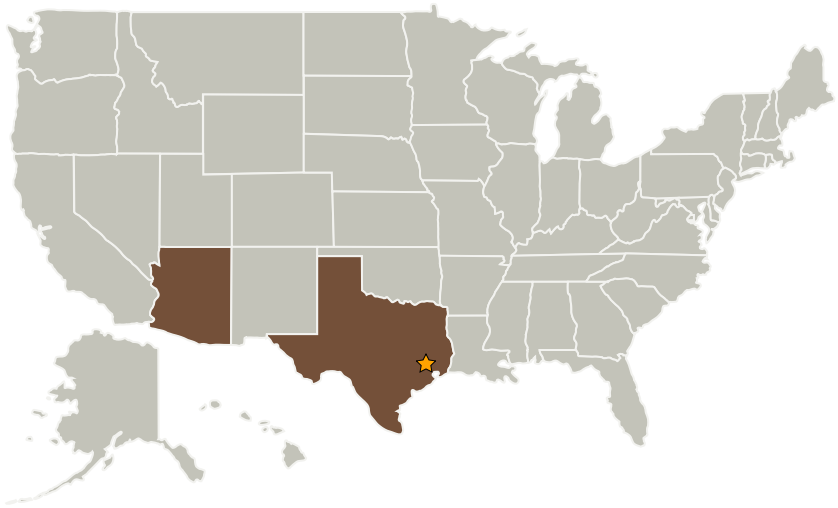
Metabolic Heat Regenerated Temperature Swing Adsorption for CO2, Thermal and Humidity Control, Phase II

Completed Technology Project (2009 - 2011)

Project Introduction

MTSA technology specifically addresses the thermal, CO2 and humidity control challenges faced by Portable Life Support Systems (PLSS) to be used in NASA's Constellation Program. Metabolically-produced CO2 present in the ventilation gas of a PLSS is collected using a CO2-selective adsorbent via temperature swing adsorption. The temperature swing is achieved through cooling to well below metabolic temperatures. The coolant can be water, liquid CO2 (LCO2), or any cryogenic fluid. Water or LCO2 is used as coolant by expanding the liquid to below sublimation temperatures when exposed to low pressure or vacuum environments. Subsequent super heated vapor, as well as additional coolant, is used to further cool the astronaut. The adsorbent is warmed using moist ventilation gas, producing condensation which is recycled at the habitat. The overall objective of the Phase 2 effort is to develop and test in a relevant environment a full-scale lunar PLSS MTSA subassembly Engineering Development Unit (EDU) comprised of a condensing ice heat exchanger (CIHX), a sorbent bed and a sublimation heat exchanger (HX). This will be achieved by developing high fidelity models and designs of the three functions, validated with test data available from previous work. At the completion of the effort, the EDU will have been manufactured and tested. The MTSA subassembly will be at TRL 5 and the EDU can be used for off-nominal operational testing as well as MTSA system integration tests.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Paragon Space Development Corporation	Supporting Organization	Industry	Tucson, Arizona

Primary U.S. Work Locations	
Arizona	Texas

Project Transitions

February 2009: Project Start

September 2011: Closed out

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.1 Cryogenic Systems
    - TX14.1.3 Thermal Conditioning for Sensors, Instruments, and High Efficiency Electric Motors